

NASA TECH BRIEF

Manned Spacecraft Center



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Method for Calculating the Stresses in Pressure Vessels

A new method calculates the elastic and plastic stresses at axisymmetric discontinuities, such as mismatched or undercut seams in pressure vessels. The method is based on nonlinear elastic theory incorporating pressure coupling effects.

Stress analysis of pressure vessels with mismatched and undercut weld seams, weld sinkage or other slope discontinuities represents a serious problem to pressure vessel designers. To date only rudimentary methods for analysis exist and a specialized knowledge of the field has been needed.

A series of equations and nondimensional design graphs analyze stress concentrations for shells which are thin, steep and long. Stresses include membrane and bending effects but not those caused by sharp corners. A sequence of calculations using readily available data (such as radius, thickness, ultimate tensile strength and yield tensile strength) gives the stress at the discontinuity.

A test program has verified the results of this novel technique.

Note:

Requests for further information may be directed to:

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